

DEPARTMENT OF TRANSPORTATION

ES-OE MS #43
1727 30TH Street, 2ND Floor
Sacramento, CA 95816



April 12, 2001

07-LA-210-35.1/49.6
07-458904

Addendum No. 1

Dear Contractor:

This addendum is being issued to the contract for construction on State highway in LOS ANGELES COUNTY IN LA CANADA FLINTRIDGE, PASADENA AND ARCADIA AT VARIOUS LOCATIONS FROM FLINT CANYON WASH BRIDGE TO BALDWIN AVENUE UNDERCROSSING.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on April 19, 2001.

This addendum is being issued to revise the Notice to Contractors and Special Provisions.

In the Special Provisions, Section 10-1.11, "REPLACE CONCRETE PAVEMENT" is revised as attached.

To Proposal and Contract book holders:

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the proposal.

Submit bids in the Proposal and Contract book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

This office is sending this addendum by UPS overnight mail to Proposal and Contract book holders to ensure that each receives it.

If you are not a Proposal and Contract book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,

ORIGINAL SIGNED BY

REBECCA D. HARNAGEL, Chief
Plans, Specifications & Estimates Branch
Office of Office Engineer

Attachment

10-1.11 REPLACE CONCRETE PAVEMENT

General — Replace concrete pavement shall consist of removing existing portland cement concrete pavement and replacing the removed pavement with Fast Setting Hydraulic Cement Concrete (FSHCC) as shown on the plans and in conformance with provisions in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions.

Attention is directed to "Maintaining Traffic" of these special provisions.

Removing Existing Pavement and Base — The exact limits of concrete pavement removal and replacement will be determined by the Engineer.

Existing concrete pavement material removed during a work period shall be replaced, in that same work period, with FSHCC pavement. In the event, the existing pavement is removed and the Contractor is unable, as determined by the Engineer, to construct, finish and cure the new concrete pavement by the time the replacement pavement is to be opened to traffic, the excavation shall be filled and compacted with a temporary roadway structural section as specified in this section "Replace Concrete Pavement."

The outline of concrete pavement to be removed shall be sawed full depth with a power-driven saw except where the concrete pavement is adjacent to an asphalt concrete shoulder.

Saw cuts within concrete pavement slabs shall be cut no more than 7 days prior to slab removal. Saw cuts made in work shifts prior to actual removal shall not be made parallel or diagonal to the traveled way and shall be cut so that traffic will not dislodge any pieces or segments.

Concrete pavement shall be removed by a non-impact method. Each pavement panel shall be removed in one or more pieces without disturbance or damage to the underlying base.

Regardless of the type of equipment used to remove concrete within the sawed outline, the surface of the concrete to be removed shall not be impacted within 0.5-m of the pavement to remain in place. Pavement removal shall be performed without damage to pavement that is to remain in place. Damage to pavement, which is to remain in place, shall be repaired to a condition satisfactory to the Engineer, or the damaged pavement shall be removed and replaced with new FSHCC pavement if ordered by the Engineer. Repairing or removing and replacing damaged pavement outside the limits of concrete pavement replacement shall be at the Contractor's expense and will not be measured nor paid for.

Removed materials shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications.

Trial Slab — Prior to placement of FSHCC pavement, the Contractor shall construct one or more trial slabs for each mix design to demonstrate that the personnel, equipment and the mixing, placing, curing, and sawing techniques will produce a concrete pavement conforming to these special provisions in the anticipated time period under similar atmospheric and temperature conditions as pavement construction and to establish the correlation described below. The Contractor shall not proceed to placing replacement pavement within the roadway until a trial slab has been constructed that meets the requirements of these special provisions.

The trial slab shall have dimensions of not less than 3 m by 6 m by 230 mm thick. The trial slab shall not be placed on the roadway or within the project limits. The trial slab shall be placed in a location agreed to by the Engineer.

During trial slab construction, beams shall be fabricated within 20 minutes of delivery of concrete. Beams shall be used to determine the early age and 7-day modulus of rupture. Beams fabricated for the early age test shall be cured under the same temperature conditions ($\pm 3^{\circ}\text{C}$) as the trial slab. The temperature of the slab and beams shall be monitored and recorded at time intervals of 5 minutes or less, 25 mm from the top, 25 mm from the bottom and 75 mm from any edge until the early age testing is completed. Beams fabricated for the 7-day test shall be cured in accordance with California Test 523, except they shall be placed into the sand at between 5 and 10 times the time to final set or 24 hours whichever is earlier. The strengths determined from these beams shall be the basis for determining whether FSHCC pavement production and placement may proceed. Strength results from beams shall be the basis for determining whether FSHCC pavement operations may proceed. Beams failing the "early age" or 7-day modulus of rupture requirements shall be cause for rejection of the trial slab.

During curing of the trial slab correlation testing shall be done to determine the relation between the modulus of rupture and ASTM Designation: C 805 or C 900 performed on the trial slab. When agreed to by the Contractor and the Engineer C 805 or C 900 shall be used to estimate the modulus of rupture of the pavement, at early age, based on the correlation. The correlation shall be established by testing at four or more time intervals. At least one test each shall be one hour before and after the opening age and one shall be within 15 minutes of the opening age. Estimates of modulus of rupture shall be calculated based on a least squares best-fit equation, either linear, exponential or logarithmic, whichever provides the best correlation coefficient.

Concrete pavement shall not be placed when the atmospheric temperature during placement and curing is expected to be below 10°C .

No more than 25 cubic meter of concrete pavement shall be replaced during the first concrete replacement work shift without Engineer's prior approval.

Materials resulting from construction of trial slabs and test specimens shall become the property of the Contractor and shall be removed and disposed of outside the highway right of way as provided in Section 7-1.13 of the Standard Specifications.

Fast Setting Hydraulic Cement Concrete

General — FSHCC shall be a concrete made with hydraulic cement that develops service strength prior to the time the lane is to be opened to public traffic as designated in "Maintaining Traffic" of these special provisions. Pavement made with FSHCC shall conform to the provisions in Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions. The requirements in Section 40-1.015, "Cement Content;" Section 40-1.05, "Proportioning;" and Section 90-1.01, "Description;" of the Standard Specifications shall not apply.

The combined aggregate grading used in concrete for replacement pavement shall be either the 37.5-mm maximum or the 25-mm maximum grading.

FSHCC pavement shall develop a flexural strength (modulus of rupture) of 2.8 MPa or greater before opening to public or Contractor traffic and also shall develop a modulus of rupture of not less than 4.2 MPa 7 days after placement. The modulus of rupture shall be considered to be the average of test results of 3 beam specimens determined by California Test 523. Beam specimens may be fabricated using an internal vibrator in conformance with ASTM Designation: C31. No single test shall represent more than the production for one day.

Modulus of rupture at early ages may be determined by estimation based on a correlation determined during trial slab placement or using beams cured under the same atmospheric and temperature conditions ($\pm 3^{\circ}\text{C}$) as the pavement. Modulus of rupture at other ages shall be determined by using beams cured and tested in accordance with California Test Method 523 except they shall be placed into the sand at between five and 10 times the time to final set or 24 hours whichever is earlier. "Early age" is defined as any time less than 10 times the time to final set as determined by ASTM Designation: C 403 and reported in the mix design submittal. Testing to determine the modulus of rupture will be performed by the Engineer. The modulus of rupture, as determined above, will be the basis for accepting or rejecting the FSHCC pavement for modulus of rupture requirements.

The cement for FSHCC pavement shall be hydraulic cement as defined in ASTM Designation: C219 and conform to the following requirements:

Property	Test Method	Requirement
Contraction in Air	California Test 527 w/c Ratio = 0.39 ± 0.010	0.053% (max)
Mortar Expansion in Water	ASTM: C1038	0.04% (max)
Soluble Chloride	California Test 422	0.05% (max)*
Soluble Sulfates	California Test 417	0.30% (max)*
Thermal Stability	California Test 553	60% (min)
Compressive Strength @ 3 days	ASTM C109	17 MPa

The test is to be done on a C 109 cube specimen cured at least 14 days and then pulverized to 100% passing the 300 μm sieve.

At least 45 days prior to intended use, the Contractor shall furnish a sample of the fast-setting hydraulic cement from each lot proposed for use and all admixtures proposed for use in the quantities ordered by the Engineer. Type C, accelerating chemical admixture, conforming to the requirements of ASTM C494, and to the requirements in Section 90-4, "Admixtures," of the Standard Specifications may be used upon approval of the Engineer. Accelerating chemical admixture shall be a non-corrosive and non-chloride admixture to be added to the concrete mix at a rate recommended by the manufacturer. In addition to the admixtures listed on the Department's current list of approved brands of admixtures, citric acid or borax may be used if requested in writing by the fast-setting hydraulic cement manufacturer and a sample is submitted to the Engineer. All chemical admixtures, if used, shall be included in all the testing for the requirements listed in the table above.

At least 10 days prior to use, the Contractor shall submit in writing to the Engineer a proposed mix design that shall include:

- A. The "opening age," the age at which the concrete will achieve the specified strength for opening to public or Contractor's traffic;
- B. The proposed aggregate gradings;
- C. The mix proportions of hydraulic cement and aggregate;
- D. The type and amount of chemical admixture;
- E. The maximum time allowed between batching and placing roadway pavement;
- F. The range of temperature over which this mix design is effective (10°C maximum);
- G. The final set time of the concrete; and
- H. Any special conditions (including water temperature) or instructions.

The Contractor shall submit more than one mix design to include the temperature range when the anticipated atmospheric temperature during placement of the FSHCC pavement exceeds 10°C. In addition, the Contractor shall furnish samples of the cement, aggregates and chemical admixture proposed for use in FSHCC pavement in the quantity ordered by the Engineer. The Contractor shall develop and furnish flexural strength gain curves for each proposed mix design. The strength gain curves for up to 7 days must be provided to the engineer prior to beginning paving with any given mix design. The minimum testing ages for strength gain curves shall be: one hour before opening age, opening age, one hour after opening age, 24 hours, 7 days and 28 days. Strength gain curves may be developed from laboratory prepared samples.

The penetration requirement in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications shall not apply.

Fast-Setting Hydraulic Cement Concrete Proportioning — Weighing, measuring and metering devices used for proportioning materials shall conform to the requirements in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications and these special provisions.

The eleventh paragraph of Section 9-1.01, "Measurement of Quantities," of the Standard Specifications shall not apply to FSHCC. When an automatic weighing system is used it shall comply with the requirements for automatic proportioning devices in these specifications. These automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, or mineral admixture for one designated batch or draft is a single operation of a switch or starter.

Aggregates shall be handled and stored in accordance with the requirements of Section 90-5.01, "Storage of Aggregates" of the Standard Specifications. Liquid admixtures shall be proportioned as required in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures," of the Standard Specifications. Mineral admixtures shall be protected from exposure to moisture until used. Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.

Proportioning devices shall be tested in accordance with California Test 109 at the expense of the Contractor as frequently as the Engineer may deem necessary to insure their accuracy. All proportioning devices shall be tested in advance of FSHCC production and re-tested upon moving to a new location.

Weighing equipment shall be insulated against vibration or movement of other operating equipment. When the plant is in operation, the mass of each draft of material shall not vary from the designated mass by more than the tolerances specified herein. Each scale graduation shall be 0.001 of the usable scale capacity but in no event greater than 10 kg or smaller than 0.45 kg.

Aggregate shall be weighed cumulatively and equipment for the weighing of aggregate shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the aggregate. Equipment for the separate weighing of the cement or mineral admixture shall have a zero tolerance of ± 0.5 percent of their designated individual batch drafts. Equipment for measuring water shall have a zero tolerance of ± 0.5 percent of its designated mass or volume.

The mass indicated for any individual batch of material shall not vary from the preselected scale setting by more than the following:

Material	Tolerance
Aggregate	± 1.0 percent of designated batch mass
Cement	± 0.5 percent of designated batch mass
Mineral Admixture	± 1.0 percent of designated batch mass
Water	± 1.5 percent of designated batch mass or volume

Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement, mineral admixture and water as provided in these specifications. Dry ingredients shall be proportioned by mass. Liquid ingredients shall be proportioned by mass or volume.

At the time of batching, all aggregates shall have been dried or drained sufficiently to result in stable moisture content such that no visible separation of water from aggregate will take place during the proportioning process. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

If separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

The -cement shall be kept separate from the aggregates until it is released for discharge into the mixer. The -cement shall be free of lumps and clods when discharged into the mixer. Fabric containers used for transportation or proportioning of the cement shall be clean and free of residue before reuse.

The weigh systems for the proportioning of the aggregate, the cement, and the mineral admixture shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and independent material-weighing device.

For all batches with a volume of one cubic meter or more, the proportioning equipment shall conform to one of the following methods:

- A. All ingredients shall be batched at a central batch plant and charged into a mixer truck for transportation to the pour site. Ingredient proportioning shall meet the requirements of Section 90-5, "Proportioning" of the Standard Specifications.
- B. All ingredients except cement shall be batched at a central batch plant and charged into a mixer truck for transportation to a remote located silo and weigh system for the proportioning of cement. This system shall proportion cement for charging the mixer truck.
- C. All ingredients except cement shall be batched at a central batch plant and charged into a mixer truck for transportation to a remote location where pre-weighed, containerized cement shall be added to the mixer truck. The cement pre-weighing operation shall utilize a platform scale. The platform scale shall have a maximum capacity of 2.5 tonnes with a maximum graduation size of 0.5 kilograms. Cement shall be pre-weighed into a fabric container. The minimum amount of cement to be proportioned into any single container shall be one half of the total amount required for the load of FSHCC being produced.
- D. Cement, water, and aggregate shall be proportioned volumetrically as required by these special provisions.

In order to check the accuracy of batch masses, the gross mass and tare mass of truck mixers shall be determined when ordered by the Engineer. The equipment shall be weighed at the Contractor's expense on scales designated by the Engineer.

The Contractor shall install and maintain in operating condition an electrically actuated moisture meter that will indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by mass of the fine aggregate.

No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced. Water added to the truck mixer at the job site shall be measured through a meter that conforms to the requirements of Section 9-1.01, "Measurement of Quantities" of the Standard Specifications.

Aggregate discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of discharge from the several bins, and from the weigh hopper, shall be interlocked so that not more than one bin can discharge at a time, and that the weigh hopper cannot be discharged until the required quantity from each of the several bins has been deposited in the weigh hopper.

Weighmaster Certificates — Each load of FSHCC delivered at the job site shall be accompanied by a weighmaster certificate showing the mix identification number, non-repeating load number, date and time at which the materials were batched, the total amount of water added to the load, the reading of the revolution counter at the time the truck mixer is charged with the cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.

Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on 90-mm diskette with a capacity of at least 1.4 megabytes. Captured data for the ingredients represented by each batch shall be followed by a line-feed carriage-return. There shall be sufficient fields to satisfy the amount of data required by these specifications.

The Contractor may furnish a weighmaster certificate that is accompanied by a separate certificate which lists the actual batch masses or measurements for a load of FSHCC provided that both certificates are: 1) imprinted with the same non-repeating load number that is unique to the contract and; 2) delivered to the pour site with the load.

Weighmaster certificates for FSHCC, regardless of the proportioning method used, shall include all information necessary to trace the manufacturer, and manufacturer's lot number for the cement being used. When proportioned into fabric containers the weight certificates for the cement shall contain the date of proportioning, the location of proportioning and the actual net draft mass of the cement. When proportioned at the pour site from a storage silo the weighmaster certificates shall contain the date of proportioning, the location of proportioning and the net draft mass of the cement used in the load.

All weighmaster certificates furnished by the Contractor shall conform to the requirements of Section 9 - 1.01, "Measurement of Quantities," of the Standard Specifications.

Volumetric Proportioning — When FSHCC is proportioned by volume, the method used shall be in compliance with the following:

Aggregates shall be handled and stored in accordance with the requirements of Section 90-5.01, "Storage of Aggregates" of the Standard Specifications. Liquid admixtures shall be proportioned as required in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures," of the Standard specifications. Mineral admixtures shall be protected from exposure to moisture until used. Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the batch-mixer storage hopper or in the feed line.

Batch-mixer trucks shall be equipped to proportion the cement, water, aggregate, and additives by volume. Aggregate feeders shall be connected directly to the drive on the cement vane feeder. The cement feed rate shall be tied directly to the feed rate for the aggregate and other ingredients. Any change in the ratio of cement to aggregate shall be accomplished by changing the gate opening for the aggregate feed. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to the nearest full or partial revolution of the aggregate delivery belt.

The aggregate shall be proportioned using a belt feeder operated with an adjustable cutoff gate delineated to the nearest quarter increment. The height of the gate opening shall be readily determinable. Cement shall be proportioned by a method that meets the accuracy requirements of these specifications. Water shall be proportioned by a meter conforming to Section 9-1.01, "Measurement and Payment" of the Standard Specifications and these specifications.

The delivery rate of aggregate and cement per revolution of the aggregate feeder shall be calibrated at the appropriate gate settings for each batch-mixer truck used on the project and for each aggregate source. The batch-mixer trucks shall be calibrated at 3 different aggregate gate settings that are commensurate with production needs. Two or more calibration runs shall be required at each of the different aggregate gate openings. The actual mass of material delivered for aggregate proportioning device calibrations shall be determined by a platform scale as specified in these special provisions.

The aggregate belt feeder shall deliver aggregate to the mixer with such volumetric consistency that the deviation for any individual aggregate delivery rate check-run shall not exceed 1.0 percent of the mathematical average of all runs for the same gate opening and aggregate type. Test run length shall be at least 500 kg each in duration. Fine aggregate used for calibration shall not be reused for device calibration.

At the time of batching, all aggregates shall have been dried or drained sufficiently to result in stable moisture content such that no visible separation of water from aggregate will take place during the proportioning process. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively until completely exhausted before starting to use another.

All rotating and reciprocating equipment on batch-mixer trucks shall be covered with metal guards.

The cement proportioning system shall deliver cement to the mixer with such volumetric consistency that the deviation for any individual delivery rate check-run shall be within 1.0 percent of the mathematical average of 3 runs of at least 500 kg each in duration. Cement used for calibration shall not be reused for device calibration.

Water meter accuracy shall be such that, when operating between 50 percent and 100 percent of production capacity, the difference between the indicated mass of water delivered and the actual mass delivered shall not exceed 1.5 percent of the actual mass for each of 2 individual runs of 1200 liters in duration. The water meter shall be calibrated in accordance with California Test 109 and shall be equipped with a resettable totalizer and to display the operating rate.

Calibration tests for aggregate, cement and water proportioning devices shall be weighed on a platform scale located at the calibration site. The weighing of test run calibration material shall be performed on a platform scale having a maximum capacity not exceeding 2.5 tonnes with a maximum graduation size of 0.5 kg. The platform scale shall be error tested within 8 hours of calibration of batch-mixer truck proportioning devices. The error test shall be performed with test masses

conforming to the requirements of California Test 109 and shall produce a witness scale that is within 2 graduations of the test mass load. This scale shall be available for use at the production site through out the production period. All equipment needed for the calibration of proportioning systems shall remain available at the production site through out the production period.

The batch-mixer truck shall be equipped so that this accuracy check can be made prior to the first operation for a project and at any other time as directed by the Engineer. Further calibration of proportioning devices shall be required every 30 calendar days after production begins, when the source or type of any ingredient is changed, or the mix design is changed. A two run spot re-calibration of cement proportioning system shall be performed each time 50 tons of cement has passed through the batch-truck mixer.

Liquid admixtures shall be proportioned by a meter.

The cement storage shall be located immediately before the cement feeder and shall be equipped with a device which will automatically shut down the power to the cement feeder and aggregate belt feeder when the cement storage level is lowered to a point where less than 20 percent of the total volume is left in storage.

The Contractor shall furnish an aggregate moisture determination at least every 2 hours of the proportioning and mixing operation. Moisture determinations shall be recorded and presented to the Engineer at the end of the production shift.

Each aggregate storage bin shall be equipped with a device which will automatically shut down the power to the aggregate belt feeder when the aggregate storage level is lowered to a point where less than 20 percent of the total volume is left in storage.

All indicators required by these specifications shall be in working order prior to commencing the proportioning and mixing operations and shall be visible while standing near the batch-mixer truck.

In addition to the requirements of the fourth paragraph of Section 5-1.10, "Equipment and Plants," of the Standard Specifications, the identifying number of batch-mixer trucks shall be at least 75 mm in height, located on the front and rear of the vehicle.

Volumetric proportioned FSHCC shall be mixed in a mechanically operated mixer of adequate size and power for the type of FSHCC to be placed. Mixers may be of the auger type and shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers that have an accumulation of hard concrete or mortar shall be removed from service until cleaned. Other types of mixers may be used provided the mixing quality meets the requirements of these special provisions.

The charge or the rate of feed to the mixer shall not exceed that which will permit complete mixing of all of the material. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected by a reduction in the volume of material or by other adjustments. The mixer shall be designed to provide sufficient mixing action and movement to the mixture to produce properly mixed FSHCC and mixing shall continue until a homogeneous mixture of thoroughly and uniformly dispersed ingredients of unchanging appearance is produced at discharge from the mixer. There shall be no lumps or evidence of non-dispersed cement at discharge from the mixer. No water shall be added to the FSHCC after discharge from the mixer.

Equipment having components made of aluminum or magnesium alloys, which would have contact with plastic concrete during mixing, transporting FSHCC, shall not be used.

Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533. The difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 10 mm. The Contractor, at the Contractor's expense, shall furnish samples of individual ingredients and freshly mixed concrete and provide facilities for obtaining the samples. Sampling facilities shall be safe, accessible, clean and produce a sample which is representative of production. Sampling devices and methods shall also meet the requirements of California Test 125.

Ice shall not be used to cool the concrete. When ice is used to cool water used in the mix, all of the ice shall be melted before entering the mixer.

Cement shall be proportioned and charged into the mixer by means that will not result either in loss of cement due to the effect of wind, or in accumulation of cement on surfaces of conveyors or hoppers, or in other conditions which reduce or vary the required quantity of cement in the concrete mixture.

Each mixer shall have a metal plate or plates, prominently attached, on which the following information is provided:

- A. Uses for which the equipment is designed.
- B. Manufacturer's guaranteed capacity of the mixer in terms of the volume of mixed concrete.
- C. Speed of rotation of the mixer.

The consistency and workability of the mixed concrete upon discharge at the delivery point shall be suitable for placement and consolidation.

Information generated by volumetric proportioning devices shall not be used for payment calculations.

The device that controls the proportioning of cement, aggregate and water shall produce a log of production data. The log of production data shall consist of a series of snapshots captured at 15-minute intervals throughout the period of daily production. Each snapshot of production data shall be a register of production activity at that time and not a summation of the data over the preceding 15 minutes. The amount of material represented by each snapshot shall be that amount produced for the period of time from 7.5 minutes before and 7.5 minutes after the capture time. The daily log shall be submitted to the Engineer, in electronic or printed media, at the end of each production shift, or as requested by the Engineer, and shall include the following:

- A. Mass of cement per revolution count,
- B. Mass of each aggregate size per revolution count,
- C. Gate openings for each aggregate size being used,
- D. Mass of water added to the concrete per revolution count,
- E. Moisture content of each aggregate size being used,
- F. Individual volume of all other admixtures per revolution count,
- G. Time of day,
- H. Production start and stop times,
- I. Day of week,
- J. Batch-mixer truck identification,
- K. Name of supplier,
- L. Specific type, size, or designation of concrete being produced,
- M. Source of the individual aggregates sizes being used,
- N. Source, brand and type of the cement being used,
- O. Source, brand and type of individual admixtures being used,
- P. Name of operator

Required report items may be input by hand into a pre-printed form or captured and printed by the proportioning device. Electronic media containing recorded production data shall be presented in a tab delimited format on a 90-mm diskette with a capacity of at least 1.4 megabytes. Each snapshot of the continuous production data shall be followed by a line-feed carriage-return with allowances for sufficient fields to satisfy the amount of data required by these specifications. The reported data shall be in the above order and shall include data titles at least once per report.

Spreading, Compacting and Shaping — FSHCC shall be spread, shaped and consolidated so that the completed pavement conforms to the thickness and cross section requirements of the plans and specifications. Sides of pavement may be constructed on a batter not to exceed 6.0 vertical to 1.0 horizontal, provided the top of the pavement is maintained at the specified width.

FSHCC to be constructed contiguous with an existing parallel concrete pavement not constructed as part of the contract shall be spread, compacted, and shaped so that completed pavement will conform to the thickness and cross section requirements of the plans and specifications.

The elevation of the pavement surface shall be such that water will not pond on either side of the longitudinal contact joint with existing pavement.

The new pavement surface at the longitudinal contact joint shall conform to the elevation of the existing concrete pavement. Any difference in elevation between the new pavement and the existing pavement shall be eliminated by finishing the new pavement within 300 mm of the existing pavement by hand methods.

Side form sections shall be straight, free from warps, bends, indentations, or other defects. Defective forms shall be removed from the work. Metal or wood side forms may be used. When wood side forms are used they shall be not less than 38 mm in thickness. Wood side forms shall conform to the provisions in Section 51-1.05, "Forms," of the Standard Specifications.

Side forms may be built up by rigidly attaching a section to either top or bottom of forms. If the buildup is attached to the top of metal forms, the buildup shall be of metal.

Width of the base of all forms shall be equal to at least 80 percent of specified pavement thickness.

Side forms shall be of sufficient rigidity, both in the form and in the interlocking connection with adjoining forms, that springing will not occur under the force from grading and paving equipment or from the pressure of concrete. The Contractor shall provide sufficient forms so that there will be no delay in placing the fast-setting hydraulic concrete due to lack of forms.

Before placing side forms, the underlying material shall be at the proper grade. Side forms shall have full bearing upon the foundation throughout their length and width of base and shall be placed to the required grade and alignment of the edge of the finished pavement. They shall be firmly supported during the entire operation of placing, compacting, and finishing the pavement.

Immediately in advance of placing fast-setting hydraulic concrete and after all subgrade operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing fast-setting hydraulic concrete.

Side forms shall remain in place until the edge of the pavement no longer requires the protection of the forms. Side forms shall be thoroughly cleaned and oiled each time they are used and before fast-setting hydraulic concrete is placed against them.

FSHCC for the full paving width shall be effectively consolidated with surface vibrators, internal vibrators, or by some other method of consolidation that produces equivalent results without segregation. Consolidation of the FSHCC shall be by means of high-frequency internal vibrators after it is deposited on the subgrade. Vibrating shall be done with care and in such manner to assure adequate consolidation adjacent to forms and uniformly across the full paving width. Use of vibrators for shifting of the mass of FSHCC will not be permitted. When vibrators are used to consolidate FSHCC, the rate of vibration shall be not less than 3500 cycles per minute for surface vibrators and shall be not less than 5000 cycles per minute for internal vibrators. Amplitude of vibration shall be sufficient to be perceptible on the surface of FSHCC more than 0.3 m from the vibrating element. The Contractor shall furnish a tachometer or other suitable device for measuring and indicating frequency of vibration.

Vibrators shall not rest on new pavement or side forms. Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

FSHCC shall be spread and shaped by any suitable powered finishing machines, supplemented by handwork as necessary. Methods of spreading, shaping and compacting that result in segregation, voids or rock pockets shall be discontinued, and the Contractor shall adopt methods which will produce dense homogeneous pavement conforming to required cross section.

After the FSHCC has been mixed and placed, no additional water shall be added to the surface to facilitate finishing. If surface finishing additives are to be used, they must be approved by the Engineer prior to use. Finishing surface additives shall be as recommended by the manufacturer of the cement used.

Joints — Prior to placing concrete against existing concrete, a 6-mm thick commercial quality polyethylene flexible foam expansion joint filler shall be placed across the original transverse joint faces and extend the full depth of the excavation with the top of the joint filler flush with the top of pavement. The joint filler shall be secured to the face of the existing pavement joint face by any method that will hold the joint filler in place during placement of concrete.

Transverse weakened plane joints in pavement replacement shall be constructed to match the spacing and skew of the weakened plane joints in the existing pavement. Where the existing transverse weakened plane joint spacing (in an adjacent lane) exceeds 4.6m, an additional transverse weakened plane joint shall be constructed equal distance between the existing joints. The provisions in the second and third paragraphs in Section 40-1.08B, "Weakened Plane Joints," of the Standard Specifications and the provisions in the third paragraph in Section 40-1.08B(1), "Sawing Method," shall not apply. Sawing of weakened plane joints shall be completed within 2 hours of completion of final finishing. The minimum depth of the cut for the weakened plane joint shall be 70 mm.

Curing Method — The method of cure for replacement pavement shall be as recommended by the manufacturer of the cement and approved by the Engineer.

Bond Breaker — A bond breaker shall be placed between the replacement pavement and the existing cement treated base. Bond breaker shall be Pigmented Curing Compound conforming to the requirements in ASTM C309, Type 2, Class A and shall contain 22 percent minimum nonvolatile vehicles consisting of at least 50 percent paraffin wax.

All foreign material and loose material remaining from slab removal shall be removed prior to application of bond breaker.

Curing compound shall be applied in two separate applications. Each application of curing compound shall be applied at the approximate rate of 0.3 to 0.5 L/m². Application of curing compound shall cover the entire surface evenly.

Temporary Roadway Structural Section — The Contractor shall provide, at the job site, a sufficient standby quantity, as determined by the Engineer, of asphalt concrete and aggregate base for construction of a temporary roadway structural section where existing pavement is being replaced. The temporary structural section shall be maintained, and later removed as a first order of work when the Contractor is able to construct and cure the new concrete pavement replacement within the prescribed time limit. The temporary structural section shall consist of 90-mm thick asphalt concrete over aggregate base.

The aggregate base for the temporary structural section shall be produced from commercial quality aggregates consisting of broken stone, crushed gravel, natural rough-surfaced gravel or reclaimed concrete and sand, or any combination thereof. The grading of the aggregate base shall conform to the 19-mm maximum grading specified in Section 26-1.02A, "Class 2 Aggregate Base," of the Standard Specifications.

The asphalt concrete for the temporary structural section shall be produced from commercial quality aggregates and asphalt binder. The grading of the aggregate shall conform to the 19-mm Maximum, Medium grading in Section 39-2.02, "Aggregate," of the Standard Specifications and the asphalt binder shall conform to the provisions for liquid asphalt SC-800 in Section 93, "Liquid Asphalts," of the Standard Specifications. The amount of asphalt binder to be mixed with the aggregate shall be approximately 0.3-percent less than the optimum bitumen content as determined by California Test 367.

Aggregate base and asphalt concrete for the temporary structural section shall be spread and compacted by methods that will produce a well-compacted, uniform base, free from pockets of coarse or fine material and a surface of uniform smoothness, texture, and density. The aggregate base may be spread and compacted in one layer and the asphalt concrete may be spread and compacted in one layer. The finished surface of the asphalt concrete shall not vary more than 15 mm from the lower edge of a straightedge, 3.6 m \pm 0.06-m long, placed parallel with the centerline and shall match the elevation of the existing concrete pavement along the joint between the existing pavement and temporary surfacing. At the option of the Engineer, FSHCC not conforming to these special provisions for Fast Setting Hydraulic Cement Concrete may be used for temporary structural section.

The material from the removed temporary structural section shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications except that removed aggregate base may be stockpiled at the job site and reused for construction of another temporary structural section. When no longer required, standby material or stockpiled material for construction of temporary structural sections shall be removed and disposed of outside the right of way in accordance with Section 7-1.13 of the Standard Specifications.

Payment and Acceptance — Replace concrete pavement will be measured and paid for in the same manner specified for concrete pavement in Sections 40-1.13, "Measurement," and 40-1.14, "Payment," of the Standard Specifications, and these special provisions, except that the provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications shall not apply.

All replacement concrete pavement produced and placed during construction of the roadway will be accepted or rejected as follows:

Replacement concrete pavement that has modulus of rupture of 2.3 MPa or greater before the lane is opened to the traffic and a 7 day modulus of rupture of 4.2 MPa or greater will be accepted and paid at the contract price paid per cubic meter of replace concrete pavement.

Replacement concrete pavement that has a modulus of rupture less than 1.8 MPa when the lane is opened to traffic will be rejected. Rejected replacement pavement shall be removed and replaced at the Contractor's expense.

Payment shall be made according to following table for other combinations of modulus of rupture achieved upon opening to traffic and at 7 days.

Percentage Pay Table

		Greater than or equal to 4.20	3.81 - 4.19	3.41 - 3.80	Less than 3.40
Modulus of Rupture (MPa) at opening to traffic	Greater than or equal to 2.30	100%	95%	90%	80%
	2.01 - 2.29	95%	95%	90%	80%
	1.80 - 2.00	80%	80%	80%	50%
	Less than 1.80	0	0	0	0

Full compensation for removing and disposing of existing concrete pavement; furnishing and placing bond breaker, furnishing and disposing of standby materials for construction of a temporary structural section; and constructing, maintaining, removing and disposing of temporary structural sections shall be considered as included in the contract price paid per cubic meter for replace concrete pavement, and no separate payment will be made therefor.

The contract price paid per cubic meter for replace concrete pavement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved, complete in place, including contractor process control and removal of existing pavement, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.